

(19)

Europäisches Patentamt

European Patent Office

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(11)

EP 0 765 832 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

02.04.1997 Bulletin 1997/14

(51) Int Cl.⁶: B65H 19/22, B65H 19/28

(21) Application number: 96660052.0

(22) Date of filing: 05.09.1996

(84) Designated Contracting States:

AT DE FI FR GB IT SE

(30) Priority: 29.09.1995 FI 954631

(71) Applicant: VALMET CORPORATION
00620 Helsinki (FI)

(72) Inventors:

- Kinnunen, Jorma
00810 Helsinki (FI)

• Mikkonen, Silvo

04430 Järvenpää (FI)

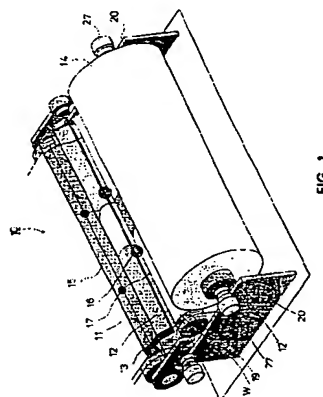
(74) Representative: Jyrämä, Hanna-Leena Maria et al
Forssén & Salomaa Oy,
Yrjönkatu 30
00100 Helsinki (FI)

(54) Method and device in reeling

(57) The invention concerns a method in reeling of a paper or board web, wherein the web (W) is supported during the reeling by means of a belt (19), which runs through the nip between the reeling cylinder (11) and the reel spool (12', 12) and which runs as guided by a roll (13) and by the reel spool (12', 12), wherein, when the paper or board reel (14) that is formed on the reel spool (12') becomes complete, the reel is pushed by means of the roll (13) into the change position and a new reel spool (12) is lowered into the gap between the roll (13) and the reeling cylinder (11) and the change device (15) is lowered onto the new reel spool (12). In the method, the tip is cut out of the web (W) from the middle towards the edges by means of water cut nozzles, and the tip is blown to around the new reel spool (12) by means of tip blowing, and an adhesive is sprayed onto the web which is passing onto the paper or board reel (14). The tip of the web (W) is cut at the same time with the gluing of the edges of the web (W) passing onto the paper or board reel (14) so that the adhesive is spread at a uniform distance (16) from the cut line (17) so as to glue the final end of the web (W) passing onto the full paper or board reel (14) to fix said final end onto the face of the paper reel (14).

Further, the invention concerns a device in reeling of a paper or board web, which device comprises a reeling cylinder (11) and a reel spool (12', 12), the web (W) being fitted to run through the nip between said cylinder and spool onto the reel spool (12', 12). The web (W) is supported during the reeling by means of a belt (19), which runs over the reeling cylinder (11) and the reel spool (12', 12) and which belt is fitted to run as guided by a guide roll (13) and the reel spool (12', 12). Further,

the device comprises members for guiding the web (W) tip that was cut at the reel change stage onto the new reel spool (12) and a change device (15), which includes displaceable water cut nozzles and displaceable adhesive nozzles. The change device (15) includes sledges or equivalent transfer devices. To the same sledge (26) or equivalent, one water cut nozzle and one adhesive nozzle have been attached. The sledges (26) or equivalent are fitted to move along guides or equivalent of the change device (15) from the middle of the paper or board web (W) towards the edges by the intermediate of an actuator so that the water cut nozzles and the adhesive nozzles of the change device (15) operate substantially at the same time and are placed in a relative position so that, parallel to each water cut (17), substantially at a uniform distance from the water cut line (17), an adhesive strip (16) is formed at the side of the web portion that passes onto the complete reel (14).



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Description

The invention concerns a method in reeling of a paper or board web, wherein the web is supported during the reeling by means of a belt, which runs through the nip between the reeling cylinder and the reel spool and which runs as guided by a roll and by the reel spool, wherein, when the paper or board reel that is formed on the reel spool becomes complete, the reel is pushed by means of the roll into the change position and a new reel spool is lowered into the gap between the roll and the reeling cylinder and the change device is lowered onto the new reel spool, in which method the tip is cut out of the web from the middle towards the edges by means of water-cut nozzles, and the tip is blown to around the new reel spool by means of tip blowing, and an adhesive is sprayed onto the web which is passing onto the paper or board reel.

Further, the invention concerns a device in reeling of a paper or board web, which device comprises a reeling cylinder and a reel spool, the web being fitted to run through the nip between said cylinder and spool onto the reel spool, in which device the web is supported during the reeling by means of a belt, which runs over the reeling cylinder and the reel spool and which belt is fitted to run as guided by a guide roll and the reel spool, which device further comprises members for guiding the web tip that was cut at the reel-change stage onto the new reel spool and a change device, which includes displaceable water-cut nozzles and displaceable adhesive nozzles.

As is well known, in reeling of the web by means of a drum reel-up or an equivalent reel-up, the web is passed along the face of the mantle of a carrier roll, reeling cylinder or equivalent before the reeling nip, in which case the web forms a belt angle over the reeling cylinder or equivalent.

A drum reel-up is used commonly for reeling the paper web coming, for example, from a paper machine, coating machine, supercalender, or printing machine. Therein the web is reeled onto a spool, and the reel that is being formed is pressed against a Pope or reeling cylinder, over which the web runs over a certain sector and which is rotated at a circumferential speed corresponding to the web speed. Before completion of the reel, a new reel spool can be brought into nip contact with the reeling cylinder, so that it also obtains the corresponding circumferential speed. As soon as the paper reel has reached the desired diameter, it is transferred apart from the reeling cylinder. Then its speed of rotation starts slowing down, which has the result that a web loop is formed between the new reel spool and the complete reel. The loop is guided, for example, by means of a compressed-air jet to be wound around the new reel spool, whereby it is torn apart from the complete reel.

As is well known, in the reeling stage the shaft of the paper reel rests and revolves ordinarily on support of two support rails. For this purpose the ends of the

shaft are provided with particular bearing parts, which also guide the run of the reel when it is, upon completion, shifted along said rails to further processing. In paper-making this further processing usually consists of slitting, wherein the reel is slit and wound into smaller rolls. For returning and changing the empty reel spools it is possible to use, for example, a crane.

In the change of the reeling onto a new reel spool, the difficult part consists of the stage in which the growing reel is shifted from the primary forks onto the secondary forks. In practice, at this stage, considerable variations occur in the linear load, which variations again permit momentary sliding of the paper on the face of the reeling cylinder. This results in occasional wrinkles in the paper in the initial stages of the reeling. Moreover, in reeling the change from the primary forks onto the secondary forks causes discontinuity in the reeling of the web, which results in broke in the centre of the paper reel. The transfer of the reel from the primary forks onto the secondary forks may also result in variations in tightness in the paper, which may be a reason for sliding and for wrinkles in the paper.

One of the means known from the prior art for avoiding the problem described above and its consequences is setting the tension of the paper as low as possible by means of regulation of the difference in speed between the reeling cylinder and the nearest drive gear preceding it. As was stated, in such a case the limiting factor is fluttering of the web and the resulting tendency of web breaks and deterioration of quality properties of the paper, for example formation of folds.

Further means known from the prior art involve raising of the linear load between the growing reel and the reeling cylinder to a level as high as possible by using an excessively high loading force on the support forks, in particular on the secondary forks, by means of which loading force the reel is pressed against the reeling cylinder. A drawback of this procedure is deterioration of the quality properties of the paper, because especially the tensile strength and stretch are reduced.

With respect to the prior art, reference is made to the **FI Patent Application No. 905284**, in which a method in reeling is described, wherein, when the machine reel is completed, a new reel spool is brought by transfer members to a stand-by position and accelerated to the web speed. At the same time as the machine reel, coupled with the centre drive, is shifted by means of the reel transfer device to the change position apart from the reeling cylinder, the new, initially accelerated reel spool is lowered onto the rails, and the change is carried out in a way in itself known. After this, the full machine reel is slowed down, and the full-reel transfer device is brought to the new reel spool, and the centre drive is coupled with the new spool.

In the present-day paper machines and devices for surface treatment of paper, attempts are made to achieve ever higher speeds, so-called high-speed reeling, wherein the speeds are higher than 1600 metres

per minute. In high-speed reeling the resistance and friction of air become higher, for example an increased speed makes the air resistance four-fold, which may produce problems in the running of the web. At the same time as attempts are made to achieve higher speeds, attempts are also made to use a maximal proportion of recycled fibre, which is, however, not equally strong as virgin fibre, and, moreover, at the same time, ever thinner paper grades are aimed at, in which case the paper grade produced is of lower strength. In such cases increased emphasis must be put on arranging the reel change so that no discontinuity arises in the reeling of the web and, at the same time, on the control of the reeling parameters.

The object of the present invention is to provide a solution for the above problems related to change in reeling. It is a further object of the invention to improve the structure of the reel and to provide stable running of the web during reeling, reel changes, and threading.

With respect to the prior art closely related to the present invention, reference is made to the **FI Patent Application No. 935669**, in which a method and a device are described in reeling of a paper or board web in a drum reel-up or equivalent. In the method of this prior-art solution in reeling of a paper or board web in a drum reel-up or equivalent, when a paper or board reel formed on a reel spool becomes complete, a new reel spool is brought by means of transfer members into a stand-by position and accelerated up to the web speed. The reel spool with the reel is transferred by means of a transfer device into a change position apart from the reeling cylinder, and the new, initially accelerated reel spool is transferred into the reeling position. When the reel spool with the reel is transferred into the change position apart from the reeling cylinder, the belt guide roll is transferred into contact with the reel that is being formed onto the reel spool. The guide roll is transferred along with the reel spool into the change position so that the web runs during the entire change on support of the belt and through the nip between the guide roll and the reel spool.

Thus, a particular object of the present invention is further development of this prior-art arrangement of change in reeling and to provide an equipment by whose means the change can be carried out in a controlled way so that the broke on the surface and in the centre of the reel is eliminated and that formation of dust out of the web is reduced.

In view of achieving the objectives stated above and those that will come out later, the method in accordance with the invention is mainly characterized in that the tip of the web is cut at the same time with the gluing of the edges of the web passing onto the paper or board reel so that the adhesive is spread at a uniform distance from the cut line so as to glue the final end of the web passing onto the full paper or board reel to fix said final end onto the face of the paper reel.

Further, the device in accordance with the invention is mainly characterized in that the change device in-

cludes sledges or equivalent transfer devices, that to the same sledge or equivalent, one water cut nozzle and one adhesive nozzle have been attached, which sledges or equivalent are fitted to move along guides or equivalent of the change device from the middle of the paper or board web towards the edges by the intermediate of an actuator so that the water cut nozzles and the adhesive nozzles of the change device operate substantially at the same time and are placed in a relative position so that, parallel to each water cut, substantially at a uniform distance from the water cut line, an adhesive strip is formed at the side of the web portion that passes onto the complete reel.

In a reel-up in accordance with the invention, the reel change can be accomplished in a controlled way in a certain change arrangement by means of a change equipment. It is an essential feature of the invention that the application of the adhesive and the cutting of the web take place at the same time so that the adhesive is applied to a uniform width from the cut line so as to glue the tail passing onto the full reel to fix it to the reel face. In this way, by means of the method and the device in accordance with the invention, at high speeds a controlled reel change and, thus, a reel of uniform quality are achieved, whereby the surface broke and centre broke in the reel have been substantially eliminated.

In the following, the invention will be described in more detail with reference to the figures in the accompanying drawing, the invention being, however, not supposed to be strictly confined to the details of said illustrations.

Figure 1 is a schematic illustration of a reel-up.

Figures 2A...2C are schematic illustrations of the change sequence in reeling.

Figures 3A and 3B are schematic illustrations of an exemplifying embodiment of a change device in accordance with the invention viewed from the top.

Figure 4 is a schematic illustration of a change equipment viewed from the front.

Figure 5 is a schematic illustration of a change device viewed from the front.

In Fig. 1 and in the comic-strip type illustration of the reel change shown in Figs. 2A...2C, the reel change is illustrated with reference to a drum reel-up, in which the main part of the drum reel-up 10 consists of a reeling cylinder 11, along whose circumference the paper web W runs before it is transferred onto the circumference of the paper reel 14 that is formed around the reel spool 12. The reel spool 12 rests and revolves by means of the bearing parts 27 in the reeling position on two support rails 20 or equivalent support constructions. The belt arrangement comprises a belt 19, which can be a wire, felt, or any other fabric permeable to air. The belt 19 runs guided by the guide rolls 13 and through the nip between the reeling cylinder 11 and the paper reel 14. The belt 19 supports the paper web W when the web arrives at the reeling device 10 and until the paper web W is wound around the paper reel 14 that is formed onto

the reel spool 12. The belt 19 extends substantially across the entire width of the machine in the cross direction.

In the arrangement it is possible to employ all reeling cylinder types in themselves known, such as grooved, perforated, or smooth cylinders. Suction roll solutions are also possible. Preferably a grooved reeling cylinder is employed, in which case the control of air currents in the area of the nip is easier. In this specification, a nip is, besides an ordinary nip shaped as a narrow line, also to be understood as referring to a support zone.

In the stage shown in Fig. 2A, the reeling cylinder 11 revolves in the direction indicated by the arrow S_1 , and the web W is reeled onto the reel drum, i.e. the reel spool 12. The reel spool 12' revolves in the direction indicated by the arrow S_2 . The paper reel 14 formed onto the reel spool 12' is almost complete, and a new reel spool 12 is in a stand-by position. The guide roll 13, which operates as a rider roll at the same time, is in a stand-by position near the reeling cylinder 11. The paper web W runs on support of the belt 19 from the reeling cylinder 11 onto the paper reel 14 that is being formed onto the reel spool 12'. The belt 19 forms an extended nip between the reeling cylinder 11 and the paper reel 14, and the length of this nip can be adjusted by means of the guide roll 13 and the belt 19.

In the stage shown in Fig. 2B the reel spool 12' with the full paper reel 14 has been shifted in some way in itself known to the change position, and the guide roll 13 has been shifted against the paper reel 14. The guide roll 13 is shifted along with the complete paper reel 14 to the change position. The new, initially accelerated reel spool 12 has been lowered into the reeling position, for example onto the rails 20, and the change is carried out, which will be described later in more detail.

In the situation shown in Fig. 2C the reel change has taken place, and the paper web W has been cut off in the zone between the complete paper reel 14 and the reel spool 12, and the paper web W has been turned onto the new reel spool 12. As is shown in the figure, the new reel spool 12 has been brought into contact with the reeling cylinder 11, and the new reel spool 12 revolves at the web speed. The full paper reel 14 on the reel spool 12 has been braked down, and the rider roll 13 has been returned to its initial position.

The change device 15 is a beam construction of a width equal to the width of the machine, in which there are water cut nozzles and tail glue nozzles moving from the middle to the sides. In Fig. 1, the water cut point of the web W is denoted with the reference numeral 17, and the gluing point with the reference numeral 16. As is shown in the figures, the rider roll 13 is a mobile roll, by whose means the paper reel 14 can be pressed when it is separated from the reeling cylinder 11. When the paper reel 14 reaches full size, it is pushed by means of the rider roll 13 into the position shown in Fig. 2B, and the new reel spool 12 is lowered between the rider roll

13 and the reeling cylinder 11. The change device 15 is lowered onto the new reel spool in the way shown in Fig. 2B. The water cut nozzles cut a wedge out of the web W from the middle towards the edges along the cutting points 17 in the way shown in Fig. 1. The middle wedge is guided by means of tip blowings 18 to around the new reel spool 12. The tip blowing 18 can be accomplished from above, and/or the tip blowing 18 can be obtained from holes provided on the centre line of the rider cylinder 13.

The adhesive nozzles, which have been synchronized in relation to the cut nozzles, spray an adhesive agent to the edges 16 at the side of the cut wedge of the web W that passes onto the paper reel 14 so that the paper reel 14 becomes a tight package without possibility of loosening of the surface layers during braking down of the paper reel 14, Fig. 2C. Upon reel change, the rider roll 13 is lowered into the lower position and the reeling takes place in the way shown in Fig. 2C.

As is shown in Fig. 3A, the change device 15 comprises guides 21, an energy transfer chain 22, water cut nozzles 23, and glue nozzles 25 as well as cylinders 24. In the situation shown in Fig. 3A, the nozzles 23;25 are in the starting position, in which the cut nozzles 23 are at least at the same point, preferably placed crosswise in the way shown in Fig. 3A, so that a sharp tip is obtained for the start. The adhesive nozzles 25 are placed somewhat behind, because the wedge is narrower at this point.

Fig. 3B shows the nozzles 23,25 during movement, and the running direction of the web is denoted with the arrow WS and the cut performed by the water jet nozzles with the reference 17 and the adhesive joint with the reference numeral 16.

Fig. 4 shows the change device 15 viewed from the front, and the reference arrow 33 represents the supply of pressurized water and the reference arrow 34 the supply of adhesive. In this exemplifying embodiment, the sledges 26 of the change device are displaced by means of cylinders 24 with no piston rods.

Fig. 5 shows a second exemplifying embodiment of the change device 15 in accordance with the invention, in which the device of displacement consists of a chain 32 and of a motor 36 that operates it.

In the change device 15 the water cut nozzles 23 and the adhesive nozzles 25 have been attached to sledges or equivalent displaceable constructions 26 moving along guides 21. At the change stage the sledges 26 start moving from the middle of the change device 15 in opposite directions, which is indicated by the arrows R_1 in Fig. 3B. Since the water cut nozzles 23 are placed crosswise in the starting position in Fig. 3A, the water cuts 17 intersect each other at the starting stage of cutting. The adhesive nozzles 25 are also placed crosswise, and the adhesive strips 16 intersect each other in the initial stage of gluing. The adhesive strips 16 accompany the cuts 17 at a distance, being placed at a uniform distance on the web W portion that passes

onto the paper reel 14. The movement of the sledges 26 or equivalent is produced, e.g., by means of an energy transfer chain 22 and cylinders 24, which have, for example, no piston rods, or by means of a chain 32 and a motor 36 that operates it. The sledges 26 of the change device move up to the edges of the change device and thus cut off the web W, and at the same time, when the web W moves in its running direction WS, the cut nozzles 23 and the adhesive nozzles 25, respectively, make cuts 17 and adhesive strips 16, respectively, to the web W substantially across the entire width of the web W.

Above, the invention has been described with reference to a preferred exemplifying embodiment of same only, the invention being, yet, not supposed to be strictly confined to the details of said embodiment. Many variations and modifications are possible within the scope of the inventive idea defined in the following claims.

Claims

1. A method in reeling of a paper or board web, wherein the web (W) is supported during the reeling by means of a belt (19), which runs through the nip between the reeling cylinder (11) and the reel spool (12',12) and which runs as guided by a roll (13) and by the reel spool (12',12), wherein, when the paper or board reel (14) that is formed on the reel spool (12') becomes complete, the reel is pushed by means of the roll (13) into the change position and a new reel spool (12) is lowered into the gap between the roll (13) and the reeling cylinder (11) and the change device (15) is lowered onto the new reel spool (12), in which method the tip is cut out of the web (W) from the middle towards the edges by means of water cut nozzles (23), and the tip is blown to around the new reel spool (12) by means of tip blowing (18), and an adhesive is sprayed onto the web which is passing onto the paper or board reel (14), **characterized** in that the tip of the web (W) is cut at the same time with the gluing of the edges of the web (W) passing onto the paper or board reel (14) so that the adhesive is spread at a uniform distance (16) from the cut line (17) so as to glue the final end of the web (W) passing onto the full paper or board reel (14) to fix said final end onto the face of the paper reel (14).
2. A method as claimed in claim 1, **characterized** in that, by means of the guide roll (13) and the belt (19) running over said roll, an extended nip is produced against the reel (14).
3. A method as claimed in claim 1 or 2, **characterized** in that the paper or board reel (14) is pressed by means of the guide roll (13).
4. A method as claimed in any of the preceding claims, **characterized** in that the tip blowing (18) is blown from above.
5. A method as claimed in any of the preceding claims, **characterized** in that the tip blowing (18) is blown from the centre line of the guide roll (13).
6. A device in reeling of a paper or board web, which device comprises a reeling cylinder (11) and a reel spool (12',12), the web (W) being fitted to run through the nip between said cylinder and spool onto the reel spool (12',12), in which device the web (W) is supported during the reeling by means of a belt (19), which runs over the reeling cylinder (11) and the reel spool (12',12) and which belt is fitted to run as guided by a guide roll (13) and the reel spool (12',12), which device further comprises members (18) for guiding the web (W) tip that was cut at the reel change stage onto the new reel spool (12) and a change device (15), which includes displaceable water cut nozzles (23) and displaceable adhesive nozzles (25), **characterized** in that the change device (15) includes sledges (26) or equivalent transfer devices, that to the same sledge (26) or equivalent, one water cut nozzle (23) and one adhesive nozzle (25) have been attached, which sledges (26) or equivalent are fitted to move along guides (21) or equivalent of the change device (15) from the middle of the paper or board web (W) towards the edges by the intermediate of an actuator (24,35) so that the water cut nozzles (23) and the adhesive nozzles (25) of the change device (15) operate substantially at the same time and are placed in a relative position so that, parallel to each water cut (17), substantially at a uniform distance from the water cut line (17), an adhesive strip (16) is formed at the side of the web portion that passes onto the complete reel (14).
7. A device as claimed in claim 6, **characterized** in that the water cut nozzles (23) are placed crosswise in the starting position so that the water cut lines (17) intersect each other.
8. A device as claimed in claim 6 or 7, **characterized** in that the adhesive nozzles (25) are placed crosswise so that the adhesive strips (17) intersect each other at the starting point.
9. A device as claimed in any of the preceding claims, **characterized** in that the actuator for shifting the transfer device (26) is a cylinder with no piston rod.
10. A device as claimed in any of the preceding claims, **characterized** in that the transfer device is a chain (32), which is fitted to be displaced by the intermediate of motors (35).

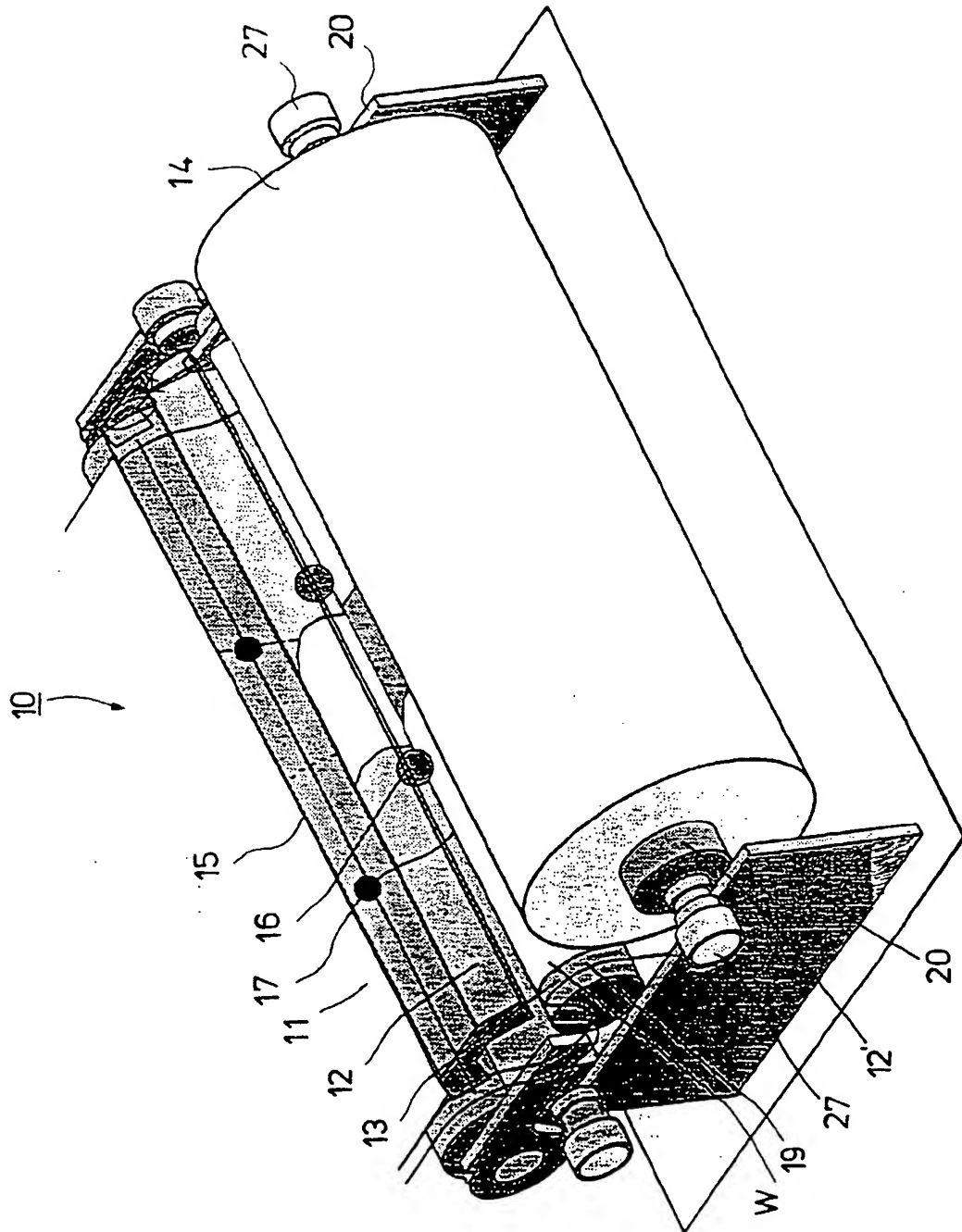


FIG. 1

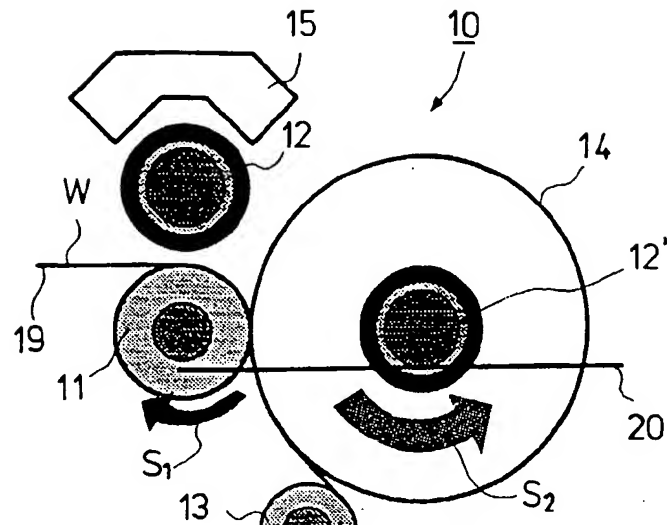


FIG. 2A

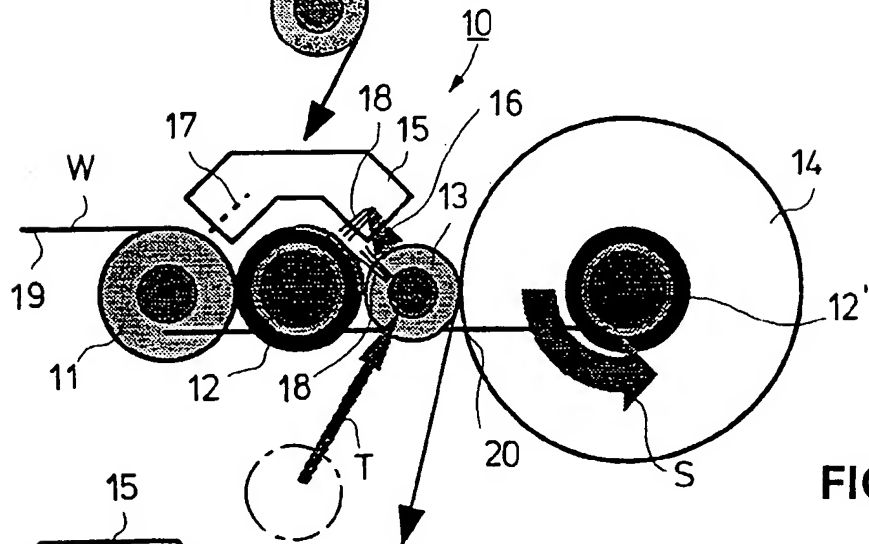


FIG. 2B

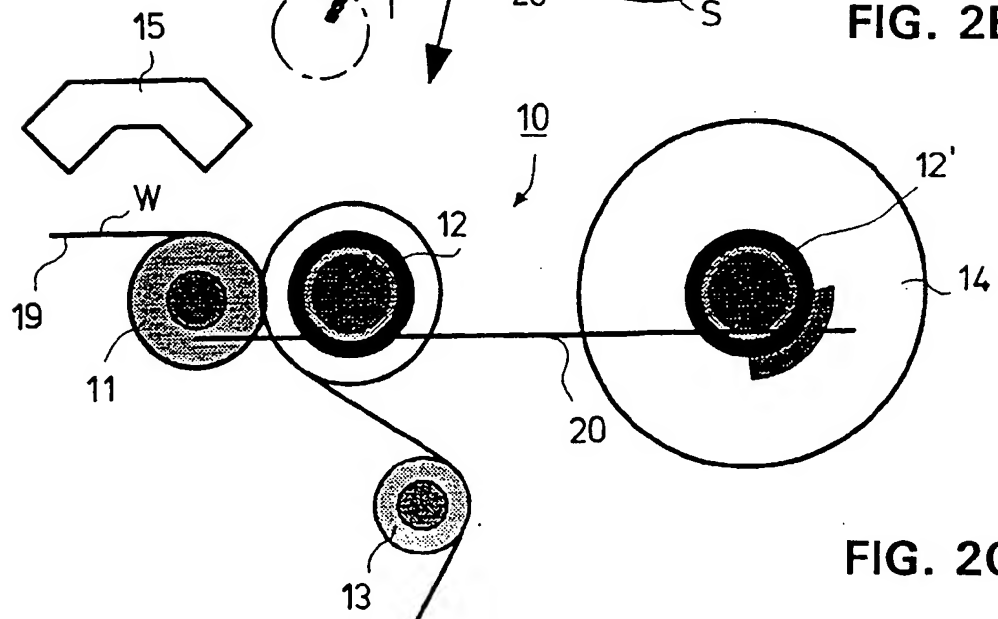


FIG. 2C

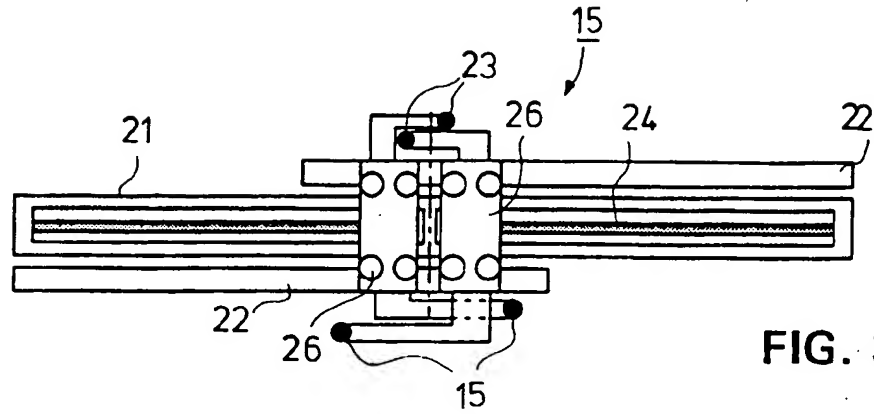


FIG. 3A

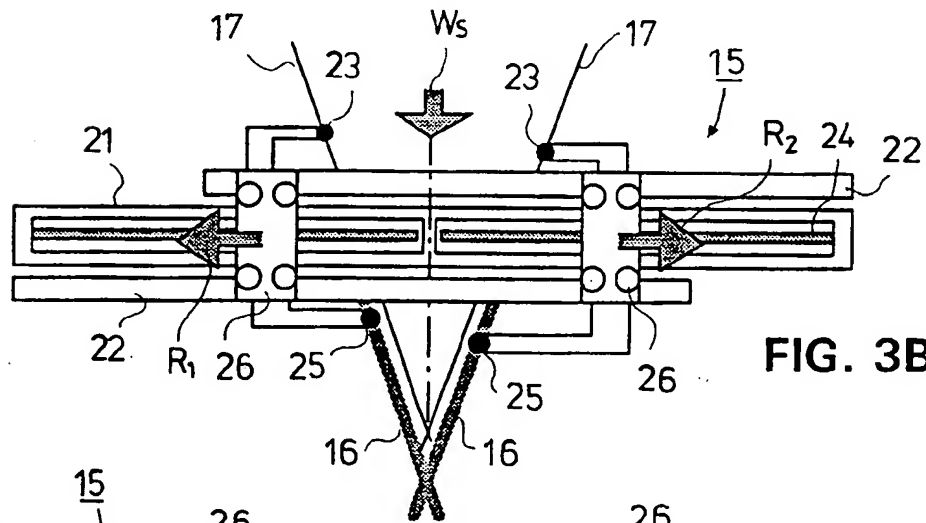


FIG. 3B

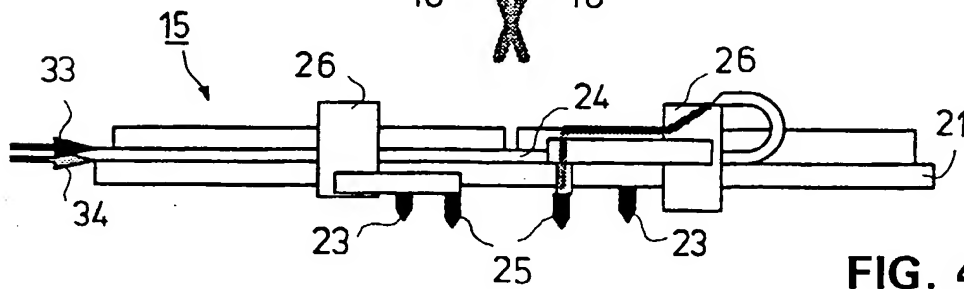


FIG. 4

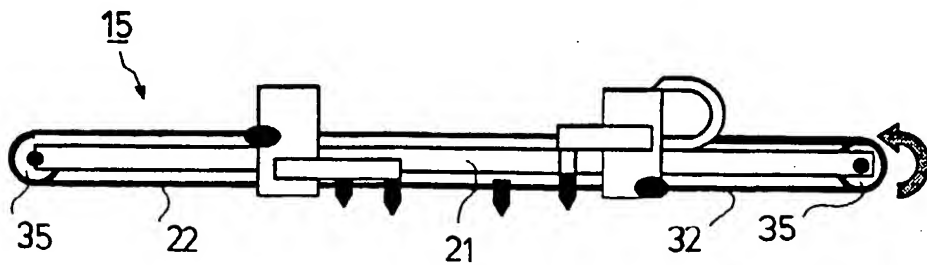


FIG. 5



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(11)

EP 0 765 832 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
19.11.1997 Bulletin 1997/47

(51) Int Cl.⁶ **B65H 19/22, B65H 19/28**

(43) Date of publication A2:
02.04.1997 Bulletin 1997/14

(21) Application number: **96660052.0**

(22) Date of filing: **05.09.1996**

(84) Designated Contracting States:
AT DE FI FR GB IT SE

• **Mikkonen, Silvo**
04430 Järvenpää (FI)

(30) Priority: **29.09.1995 FI 954631**

(74) Representative: **Jyrämä, Hanna-Leena Maria et al**
Forssén & Salomaa Oy,
Yrjönkatu 30
00100 Helsinki (FI)

(71) Applicant: **VALMET CORPORATION**
00620 Helsinki (FI)

(72) Inventors:
• **Kinnunen, Jorma**
00810 Helsinki (FI)

(54) **Method and device in reeling**

(57) The invention concerns a method in reeling of a paper or board web, wherein the web (W) is supported during the reeling by means of a belt (19), which runs through the nip between the reeling cylinder (11) and the reel spool (12', 12) and which runs as guided by a roll (13) and by the reel spool (12', 12), wherein, when the paper or board reel (14) that is formed on the reel spool (12') becomes complete, the reel is pushed by means of the roll (13) into the change position and a new reel spool (12) is lowered into the gap between the roll (13) and the reeling cylinder (11) and the change device (15) is lowered onto the new reel spool (12). In the method, the tip is cut out of the web (W) from the middle towards the edges by means of water cut nozzles, and the tip is blown to around the new reel spool (12) by means of tip blowing, and an adhesive is sprayed onto the web which is passing onto the paper or board reel (14). The tip of the web (W) is cut at the same time with the gluing of the edges of the web (W) passing onto the paper or board reel (14) so that the adhesive is spread at a uniform distance (16) from the cut line (17) so as to glue the final end of the web (W) passing onto the full paper or board reel (14) to fix said final end onto the face of the paper reel (14).

Further, the invention concerns a device in reeling of a paper or board web, which device comprises a reel-

ing cylinder (11) and a reel spool (12', 12), the web (W) being fitted to run through the nip between said cylinder and spool onto the reel spool (12', 12). The web (W) is supported during the reeling by means of a belt (19), which runs over the reeling cylinder (11) and the reel spool (12', 12) and which belt is fitted to run as guided by a guide roll (13) and the reel spool (12', 12). Further, the device comprises members for guiding the web (W) tip that was cut at the reel change stage onto the new reel spool (12) and a change device (15), which includes displaceable water cut nozzles and displaceable adhesive nozzles. The change device (15) includes sledges or equivalent transfer devices. To the same sledge (26) or equivalent, one water cut nozzle and one adhesive nozzle have been attached. The sledges (26) or equivalent are fitted to move along guides or equivalent of the change device (15) from the middle of the paper or board web (W) towards the edges by the intermediate of an actuator so that the water cut nozzles and the adhesive nozzles of the change device (15) operate substantially at the same time and are placed in a relative position so that, parallel to each water cut (17), substantially at a uniform distance from the water cut line (17), an adhesive strip (16) is formed at the side of the web portion that passes onto the complete reel (14).

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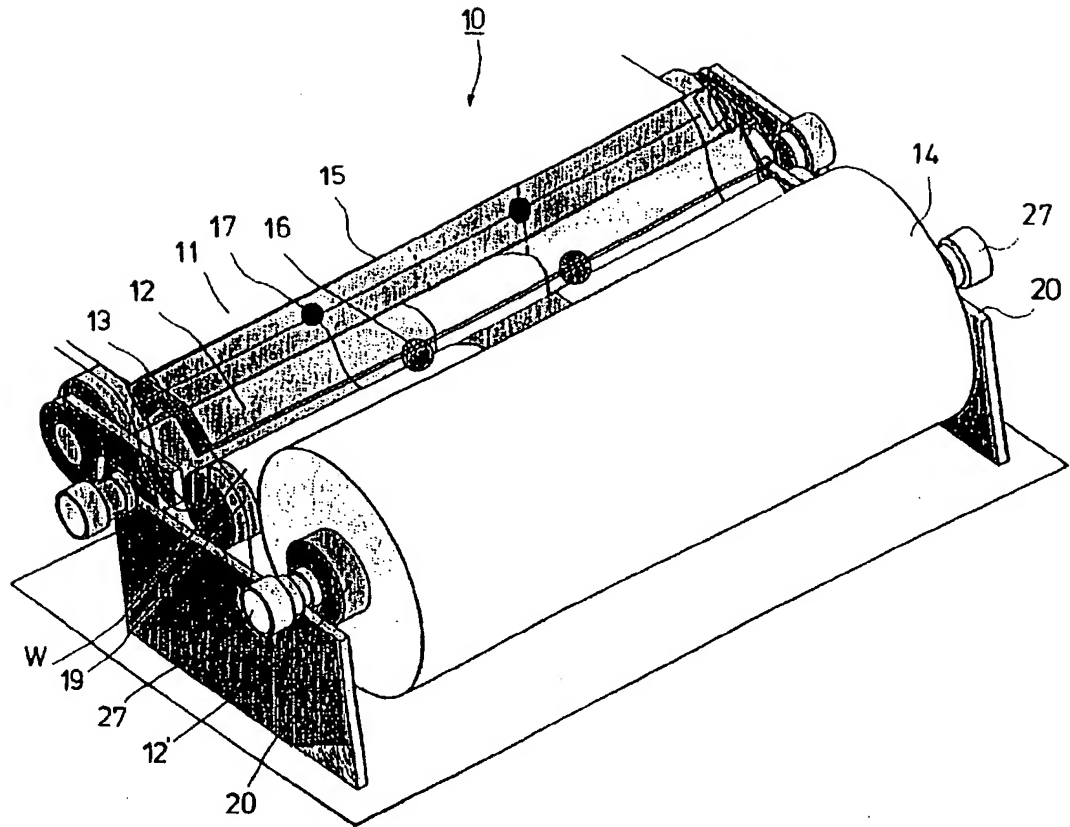


FIG. 1



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EUROPEAN SEARCH REPORT

Application Number
EP 96 66 0052

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO 92 06911 A (BELOIT CORPORATION) * abstract; figures *	1,6	B65H19/22 B65H19/28
A	EP 0 543 788 A (VALMET PAPER MACHINERY INC.) * abstract; figure 1 *	1,6	
A	WO 94 03386 A (BELOIT TECHNOLOGIES INC.) * abstract; figures *	1,6	
D,A	EP 0 658 504 A (VALMET PAPER MACHINERY INC.) * the whole document * & FI 94 231 A	1,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 September 1997	Examiner Helpiö, T.
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 01.92 (P04.011)